

## REMARKS

Claims 1 to 25 are pending in the instant application. Applicants respectfully request reconsideration and reexamination of the application, as amended.

The specification has been amended to recite that Figure 2 contains voids and Figure 2, as amended, now contain voids shown as reference numbers 240. No new matter has been added to the specification or the drawings.

### **Objections to the Drawings**

The Office Action states that the voids and the smoothening by abrasive laden slurry polishing must be shown and identified by reference numbers or the features are to be cancelled from claims 3 and 6.

Figure 2 has been amended to show voids 240 on the body 200.

In claim 6, the passageways have been smoothed by abrasive laden slurry polishing, which is a processing step that cannot be easily depicted in the Figures. Applicants respectfully submit that the passages, a portion of which is shown as input opening 210 in Figure 2, is smooth thereby satisfying the drawing requirements.

Withdrawal of the objections is requested.

### **Specification**

The OA objects to the title of the invention, stating that it is not descriptive. Applicants have amended the title.

The OA objects to the specification under 37 CFR 1.75(d), stating that the unitary body (claim 1), voids (claim 3) in the unitary body, and that the passages have been smoothened by an abrasive laden slurry polishing (claim 6) have not been described.

Applicants submit that the term "unitary body" has been described throughout the specification, such as, e.g., on page 4, line 15; page 5, line 20; page 10, line 29; page 16, line 15; and page 18, line 15. The terms "voids" and "abrasive laden slurry polishing" have now been described in the amended specification on page 11.

Withdrawal of the objections are requested.

**Claim Rejections under 35 USC § 102***The Iwasaki Reference*

Claims 1 and 7 to 11 stand rejected under 35 USC 102(b) as being anticipated by Iwasaki (US Patent 4,534,615). Applicants traverse this rejection for the following reason(s).

Iwasaki states that one object of his invention is to provide a scanning type laser system which can uniformly emit a laser beam at high output density and over a wide area.<sup>1</sup> An embodiment of Iwasaki's invention is described in Fig. 1 using light guide 16. The light guide 16 is comprises of a plurality of optical fibers (emphasis added).<sup>2</sup> At the input end of the light guide 16, i.e., at the end closer to the scanning mirror 14, the optical fibers are arrayed in a line along the scanning direction of the laser beam. At the middle portion, the optical fibers are twisted. At the light-emitting end, i.e., at the end closer to the kaleidoscope bundle 18, the optical fibers are arrayed in a 3x3 matrix fashion.<sup>3</sup> In the fifth embodiment of FIG. 5, the optical fibers of light guide 16 are arrayed circularly, and not rectilinearly at the input end.<sup>4</sup>

Applicants' invention, as recited in claim 1, comprises a unitary body that has a plurality of integrally formed passageways and each passageway connects a single input opening with a single output opening. As far as Applicants can discern, Iwasaki's invention uses a light guide made from a plurality of optical fibers. Iwasaki does not disclose either expressly or impliedly the use of a body or a body that has a plurality of integrally formed passageways.

Item 6 of the Office Action (OA) states "it is inherent that the unitary body and other components are encased and anchored in a housing (not shown) to provide protection." Applicants traverse this ground of rejection for the following reason(s).

The concept of inherency in the context of anticipation was defined by one court as follows: "[a]nticipation is not avoided where a prior achievement was deliberate or a necessary consequence of what was intended even though the achiever did not fully appreciate uses, purposes, or properties of the product or process<sup>5</sup> (emphasis added). Furthermore, anticipation

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<sup>1</sup> Iwasaki '615 at column 3, lines 5-8

<sup>2</sup> *Id.* at column 3, lines 59-60

<sup>3</sup> *Id.* at column 3, lines 62-69

<sup>4</sup> *Id.* at column 5, lines 3-8

<sup>5</sup> See *General Electric Co. v. Hoechst Celanese Corp.*, 683 F.Supp 305 16 USPQ2d 1977, 1982 (Del. 1990)

by inherency requires that (1) the missing descriptive matter be “necessarily present” in the prior art reference and that (2) it would be so recognized by persons of ordinary skill in the art.<sup>6</sup>

With the above given standards, Applicants submit that, without the benefit of hindsight, it cannot be stated that Iwasaki’s light guide 16 inherently contains a unitary body and other components which are encased and anchored in a housing to provide protection (presumably to the optical fibers 9. One skilled in the art, reading the Iwasaki reference, cannot state that a unitary body having a plurality of integrally formed passages (as claimed by Applicants) is a necessary consequence of the light guide 16 because there is no description (and thus no enablement) of how to construct the light guide. Figures 1 and 5 of the Iwasaki reference only show dashed line to depict the light guide 16 and the only information one skilled in the art is given about the light guide is that it contains optical fibers. Because the Iwasaki reference contains no written description of the light guide, one skilled in the art must guess what how it might be constructed. For example, it may be possible that the optical fibers are held together by some fastening means, such as, e.g., by a clamp having a plurality of circularly shaped grooves to hold the fibers at one end and a block clamp having a plurality of circularly shaped grooves to hold the optical fibers at the other end in a 3x3 arrangement in the case of Figure 1. Alternatively, the fastening means could be some type of adhesive used to keep the optical fibers together. Thus, Applicants respectfully submit that the OA has not stated how (1) the missing descriptive matter be “necessarily present” in the Iwasaki reference and that (2) it would be so recognized by persons of ordinary skill in the art.

Based on the foregoing, Applicants submits that claims 1 and 7 to 11 are novel over Iwasaki. Withdrawal of the rejection is requested.

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<sup>6</sup> See *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991)

*The Shahid Reference*

Claims 14, 17, 18 and 20 stand rejected under 35 USC 102(e) as being anticipated by Shahid (US Patent 6,351,590). Item 7 of the OA specifically refers to Fig. 3 of Shahid '590. Applicants traverse this rejection for the following reason(s).

In connection with Fig. 3, Shahid '590 discloses that a preferred connector 42 is a plug-like high density optical connector 50 formed from stackable multi-fiber connectors.<sup>7</sup> Figure 4 shows an array a parallel V-grooves 82 for receiving and holding the optical fibers of an optical fiber ribbon 68 (of Fig. 3).<sup>8</sup> As best shown in Figs. 4, 6, 7 and 13, these V-grooves do not span the entire length of each plate as recited by Applicants in claim 14. Thus, the Shahid '590 reference cannot anticipate claim 14. Because claims 17, 18 and 20 are dependent on claim 14, they are also novel over the Shahid '590 reference. Withdrawal of the rejection of claims 14, 17, 18 and 20 is requested.

Claims 21-24 stand rejected under 35 USC 102(e) as being anticipated by Shahid '590. Item 8 of the OA states that Figs. 1-2 in Shahid shows a rigid body 20 having a plurality of hollow tubes (passageways), each tube with an input end and an output end disposed between end plates 42 with a plurality of openings wherein the openings at the two ends are configured differently. Applicants traverse this rejection for the following reason(s).

Shahid's Figs. 1 and 2 shows schematically how the optical harness 10 transitions rows of a plurality of fibers 17, 19 disposed toward a first portion 12 of the optical harness 10, to a plurality of columns of optical fibers 21, 23, 25 disposed towards a second portion 14 of the harness 10, where the fibers have common positions in the rows.<sup>9</sup> A holding and routing mechanism 20 is disposed intermediate first portion 12 and second portion 14 of the optical harness 10 and arranged and configured to maintain the fiber optic row cables 16 in the preferred first plane orientation and the fiber optic column cables 18 in the preferred second plane orientation.<sup>10</sup>

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<sup>7</sup> Shahid '590 at column 6, lines 62-64

<sup>8</sup> *Id.* at column 8, lines 38-41

<sup>9</sup> *Id.* at column 4, lines 49-54

<sup>10</sup> *Id.* at column 5, lines 14-19

The Shahid '590 reference does not anticipate Applicants' claims 21-24 because the reference does not disclose a body having a plurality of hollow tubes, each of the tubes having an input end and an output end. What Shahid shows, particularly in Fig. 2, is a schematic representation of how the optical fibers (denoted as B', R', and G' in the top ribbon) are transitioned inside the holding and routing mechanism 20. Nowhere does Shahid describe or enable one skilled in the art how to make and use the mechanism 20. One skilled in the art reading the Shahid reference can understand that the optical fibers are somehow transitioned but one skilled in the art would not understand that plurality of hollow tubes are used to aid in the transition.

Item 8 of the OA further states that Shahid discloses the use of flexible tubes to be known in the art and Shahid (Fig. 3) show tubes or passageways made in two halves.

Shahid states that to provide a perfect shuffle cross-connect communication, opposing free ends of the fiber optic row cables and fiber optic column cables, respectively, each preferably includes a connector 42. Fig. 3 shows a preferred optical connector to be used in conjunction with the optical harness 10. One skilled in the art reading the Shahid reference would not necessarily conclude that two sets of V-grooves 82 (in Fig. 4) would be appropriate for use in the optical harness 10. Furthermore, even if Shahid does state that use of flexible tubes is known in the art, because Shahid does not describe how to make and use the holding and routing mechanism 20, one skilled in the art would be unable to conclude how to import the V-grooves of Figs. 3 and 4 or how to integrate flexible tubes into the mechanism 20.

For the foregoing reasons, Applicants submit that claims 14, 17, 18, 20 and 21-24 are novel over the Shahid '590 reference. Withdrawal of the rejection is requested.

### **Claim Rejections under 35 USC § 103**

Claims 2 to 5, which depend from claim 1, stand rejected under 35 USC 103(a) as being unpatentable over Iwasaki in view of what the Examiner has termed as "Applicants' admitted prior art" (AAPA) referring to page 9, line 13-16 of Applicant's specification. Item 10 of the OA states that Iwasaki shows all the features of these claims as described in ¶6 except the material of the unitary body to be a polymer or a metal and the use of an additive manufacturing process.

AAPA shows the use of polymers or metals for unitary bodies ( housings) for optical fiber components to be well known. Applicants traverse this rejection for the following reason(s).

Applicants have distinguished its invention, as embodied in claim 1, over Iwasaki because, among other reasons, Iwasaki does not disclose a unitary body that has a plurality of integrally formed passageways each connecting a single input opening with a single output opening. Thus one skilled in the art reading Iwasaki with what the Examiner has termed as AAPA will not arrive Applicants' invention as embodied in claims 2 to 5.

Claim 6, which depends from claim 1, stands rejected under 35 USC 103(a) as being unpatentable over Iwasaki in view of Chen *et al.* (US Patent 4,086,001). In item 11 of the OA, it is stated that Iwasaki shows all of the features of this claim as described in ¶6 except the use of abrasive laden slurry polishing. Chen discloses the use of abrasive laden slurry for polishing optical waveguides (col. 2, lines 32-39). It would have been obvious for one skilled in the art to use abrasive laden slurry to polish Iwasaki's passageways to provide for a smoother surface as taught by Chen. Applicants traverse this rejection for the following reason(s).

Applicants have distinguished its invention, as embodied in claim 1, over Iwasaki because, among other reasons, Iwasaki does not disclose a unitary body that has a plurality of integrally formed passageways each connecting a single input opening with a single output opening. Applicants' claim 6 recites that the passageways have been smoothed by abrasive laden slurry polishing. Chen deals with planar optical waveguides. Even if Chen discloses polishing a waveguide using abrasive laden slurry, it does not cure the deficiencies of Iwasaki because the combination of these two references will not lead one skilled in the art to Applicants' invention since there are no passageways in Iwasaki so that it can be polished with abrasive laden slurry.

Claims 12 and 13, which depend from claims 1 and 12 respectively, stand rejected under 35 USC 103(a) as being unpatentable over Iwasaki in view of Shahid '590. In item 12 of the OA, it is stated that Iwasaki shows all the features of these claims as described in ¶7 (believed to be ¶6) except the unitary body mounted in a plug-in card to form a rack mounted optical shuffle. Applicants' invention does not provide any reasons or specific problem solved by such an arrangement. Shahid (Fig. 3) shows a unitary body connected to a plug-in card 52 (believed to be 42) to form a rack mounted optical module. It would have been obvious for one skilled in the art

to arrange Iwasaki's unitary body in a rack mounted optical shuffle. Applicants traverse this rejection for the following reason(s).

Applicants have distinguished its invention, as embodied in claim 1, over Iwasaki because, among other reasons, Iwasaki does not disclose a unitary body that has a plurality of integrally formed passageways each connecting a single input opening with a single output opening. Even if Shahid's connector 42 is used with Iwasaki's light guide 16, this combination does not arrive at Applicants' claimed invention because the resulting combination still does not contain a unitary body having a plurality of integrally formed passageways.

Claims 15 and 16, which depend from claim 14, stand rejected under 35 USC 103(a) as being unpatentable over Shahid '590 in view of Engstrand (US Patent 6,224,269). Item 13 of the OA states that Shahid shows all the feature of these claims as described in ¶7 except at least one passageway being nonlinear and the channels intersecting on at least one plate. Engstrand (Figs. 1-3) shows such an arrangement of passageways and channels on a plate. It would have been obvious for one skilled in the art to arrange Shahid's channels and passageway in a configuration shown by Engstrand because this would provide a shuffling of the passageways. Applicants' traverse this rejection for the following reason(s).

Applicants have distinguished its invention as embodied in claim 14 over the Shahid '590 reference. Engstrand '269 states that the cross-connected optical fibers 2 reside inside a MT-connector.<sup>11</sup> Engstrand shows that the actual optical fibers cross and does not show individual plates having channels where at least two of the channels intersect as Applicants have claimed.

Claim 19, which depends from claim 14, stands rejected under 35 USC 103(a) as being unpatentable over Shahid '590 in view of Tanguay (US Patent 5,568,574). Item 14 of the OA states that Shahid shows all the features of the claim as described in ¶7 except for use of milling for making channels. Tanguay disclosed the use of milling for an additive manufacturing process. AAPA shows the use of polymers or metals for unitary bodies for optical fiber components to be well known. It would have been obvious for one skilled in the art to make Iwasaki's unitary body of polymer or metal as shown by AAPA. Applicants traverse this rejection for the following reason(s).

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<sup>11</sup> Engstrand '259 at column 1 line 65 to column 2, line 1

Applicants have distinguished its invention as embodied in claim 14 over the Shahid '590 reference. Even if Tanguay discloses milling processes, the combination of the references, even when combined with the purported AAPA would not arrive at Applicants' invention because none of the references disclose that that each plate in the body being formed with a plurality of channels spanning the entire length of the plate where the channels are formed by milling.

Finally, claim 25 stands rejected under 35 USC 103(a) as being unpatentable over Shahid '590 in view of Hutton *et al.*

Applicants are unable to respond to this rejection because the Hutton reference has not been identified by a reference number in the Examiner's "Notice of References Cited" as part of paper number 10. Applicants have not identified Hutton *et al.* reference in any of their IDS and SIDS.

For the above reasons, Applicants submit that the various claims are patentable. Claim 25 cannot be responded to at this time.

Applicants submit that the application is in condition for allowance. Allowance of claims 1-24 at an early date is respectfully solicited. The Examiner is invited to contact the undersigned to discuss this application should it be necessary.

Respectfully submitted,

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Date

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Marked-up version showing the changes made:

In the Specification

On page 1, line 3 in the title:

~~OPTICAL MANIFOLD~~ THREE DIMENSIONAL OPTICAL CIRCUITS

On page 11, lines 5 to 20

Referring now to Figure 2, a perspective view of a stacked eight by eight shuffle manifold 200 is shown. As shown here, the input openings 210 and the output openings 220 are arranged in an 8x8 matrix with each of the columns of the input end and rows of the output end arranged in a stacked configuration with support members 230 disposed therebetween. The passages that span between each input opening and each output opening can be smoothed by abrasive slurry polishing. Voids 240 can be part of the manifold 200 to reduce the amount of polymeric material used. The support members 230 serve to ensure proper spacing of the columns and rows, and also to provide additional strength and rigidity to the finished part. When filled with optical fibers, not shown, this particular embodiment produces a perfect shuffle in that the individual fibers of row 1 from columns 1-8 are brought together in column 1, rows 1-8 of the output end. The fibers of input row 2, columns 1-8 are shuffled to be arranged in column 2, rows 1-8 of the output end and so forth, with the fibers of row 8, columns 1-8 being shuffled into column 8, rows 1-8 of the output end of the manifold. It is to be noted that the CAD system has been programmed to ensure that none of the individual fibers are forced to experience a bend tighter than the critical bend radius, thereby minimizing optical signal loss and maximizing mechanical life span for each of the fibers passing through the optical manifold.